

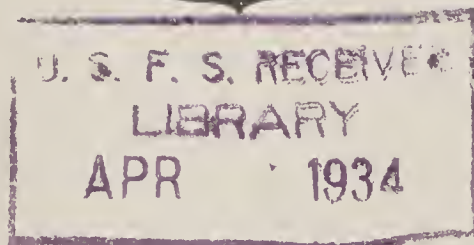
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EXECUTIVE AND PERSONNEL
MANAGEMENT
ON THE
NATIONAL FORESTS



A MEDIUM FOR THE EXCHANGE OF IDEAS AND
EXPERIENCES BY OPERATING EXECUTIVES
FOR THE BETTERMENT OF THE
SERVICE

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GAME MANAGEMENT PLAN FOR MULE DEER

on the

KAIBAB NATIONAL FOREST

By WALTER G. MANN

[This outline as here given is not intended to be complete in every particular. It has been briefed in places, but it gives the actual working features of the Kaibab plan.]

Location of Area.

The area is the Kaibab National Forest in northern Arizona and contains 723,000 acres. The Kaibab Mountain is a long, high plateau extending out from the highlands of Utah into the lower lands of Arizona. The plateau lies almost north and south, and has gradual slopes from the summer range, which is at an altitude of 8,000 to 9,300 feet, to the winter range, which has an altitude of from 4,500 to 5,500 feet. The highway to the Grand Canyon North Rim extends through the middle of the area.

History.

The Kaibab Plateau was once a great Indian hunting ground. The Indians would gather in the fall to a great ceremonial feast, and take hides for winter clothing and meat for winter food. The white men also took great numbers of deer in the days of the early settlement. According to the best information obtainable, this condition prevailed up to the creation of the game preserve.

The area was created as a National Game Preserve in June, 1906. All killing of deer was prohibited, and Government hunters were employed to kill mountain lions and coyotes. The estimated number of deer at the time of creation of the game preserve was 3,000. Removal of enemies permitted the number to increase to probably over 100,000 by 1924. This number exceeded the food supply, and was reduced by hunting and by starvation. The number of deer is estimated to be 16,000 in 1933. This number seems to be within the food supply, and natural forage is beginning to recuperate.

Objectives of Management.

The Kaibab deer will be maintained in their natural wild state, with no attempt to make them tame, and no attempt at artificial feeding. The aim will be to balance the number of deer with the amount of forage produced on the range.

The detailed objectives will be:

1. To maintain and manage the deer for their highest use, which includes their value to summer residents and visitors, use in natural science studies, and sportsmen hunting.
2. To maintain as many deer as the permanent welfare of the range will justify.

3. To build up the range to its maximum carrying capacity by proper protection and management and by such artificial means as may be found practicable.

4. To preserve the esthetic value of the deer and their summer feeding grounds, protect them on the high ranges and disturb them there as little as possible.

5. To control the number of deer insofar as is necessary, by disposal of the yearly surplus by the best methods possible. These methods include trapping and shipping deer alive to other ranges and sportsmen hunting.

6. To limit the number of predators so that all factors on the area will be under control.

7. To correlate all uses of the area, such as game, recreation, timber production, and grazing of domestic stock, to the end that each will have its place without undue injury to the other.

Biological Nature of Species.

The deer on the Kaibab are the Rocky Mountain mule deer (*Odocoileus hemionus macrotis*) occurring in the Rocky Mountain region from British Columbia to Arizona and New Mexico. This is the largest of the deer, and is characterized by large antlers with a Y-fork on the main branch, the large mule-like ears, and a cylindrical tail that is all white except for the black tip. . . . In winter the body is gray with black on the underparts, forehead, nose, top of neck and tip of tail. A large rump patch, the upper tail, and the belly are white. The change to winter coat takes place in early September. The summer coat is reddish brown, and the change to summer coat is in April and May. . . . The shedding is delayed during years when the deer are in poor condition.

Rutting season is from the middle of November to the middle of December.

Fawns are born from the middle of June to the middle of July. This is soon after the spring drift to the summer range. They are born on the protected sides of ridges and not in the canyons and deep hollows.

Studies to date show that the same deer use the same winter and summer range each year, and that they travel through the same lanes each year. A few of them may drift away, but the bulk of the herd remains on the same range where they have been raised.

Environmental Requirements. Brush cover and down timber are needed at fawning time as hiding places for fawns. Brush cover is necessary on the winter range for protection from storms and protection of fawns from eagles. Water is necessary on the late summer and fall ranges, but it is not definitely known what the water requirements are. Deer on the Kaibab can and do travel long distances to water. When the forage is green in the spring and early summer, deer go many days without water. Water is necessary in winter, but it is obtained mostly from snow. Deer go to water holes more in fall than any

other time, when the forage is dry and before snow has fallen.

Deer are browsers by preference. They eat some grass in late winter and early spring while it is new and green, but eat very little grass in summer and fall. They have preference for certain forage plants.

For further information refer to "Biological and Game Management Studies" being carried on for the Kaibab.

Present Capital Stock.

Cover and Seasonal Ranges.

Summer Range, about 300,000 acres. Deer come onto this range in May, and leave in October. Four and a half months' use.

Winter Range, about 300,000 acres. Deer come in November and leave in March. Four and a half months' use.

Spring and fall range, about 110,000 acres. Three months' use.

The summer range is within the ponderosa pine type and the spruce-fir type. Intermixed with these types are aspen patches, and also aspen in mixture with conifers. There are many open grass meadows that produce some weeds.

The spring and fall range is from the ponderosa pine type to the pinon-juniper type, with scrub oak, service berry, cliff rose, and aspen intermixed.

The winter range is covered with juniper and some pinon, with cliff rose and sagebrush. Juniper and pinon furnish plenty of cover.

Cover is ample on all these ranges. Proper management must keep it so.

Present Capital Stock.

Food Supply.

A range survey has not yet been made, so quantity of forage available is not stated. Forage needed for deer is about equal to that needed by one and one-half sheep. Studies carried on while trapping and shipping live deer show that each deer requires per day about six pounds of alfalfa hay and oats, supplemented with some sagebrush, cliff rose and juniper. Alfalfa hay and oats are rich in food value, and if the same amount of nourishment was taken from the natural range, it would probably amount to ten pounds per day per deer. If we can find out the poundage produced in annual growth on the natural range, it will be possible to determine the number of deer the area will support.

In the absence of a range survey for deer and an estimate of the annual production of forage, the stocking of the area by deer must be done in accordance with the degree to which the plants are browsed. A number of plots are established and the annual growth is measured on these plots each year. After the grazing season the annual growth on the forage plants are again measured and percentage of utilization figured. The present rate of stocking the area to deer is figured on 75 per cent use of the key plants. This percentage may be varied if future studies show it to be too much or too little.

Food supply on Summer Range. There is a balance in acreage between the summer and other seasonal ranges, but there is much heavy timber on the summer range under which very little forage grows, and this cuts down the forage-producing area. Therefore, summer grazing of plants must be watched very closely. The principal forage plant on the summer range is aspen. It is the plant that must be depended upon for quantity. It will be used as the key species and the indicator for the whole summer range. It is very palatable, and if aspen is not overgrazed other plants will not be overgrazed. Mushrooms supply much forage on wet seasons, but since the quantity grown fluctuates with the rainfall, they cannot be depended upon as a constant summer forage. The range must be stocked in accordance with the amount of forage produced on dry years.

Food Supply on Spring and Fall Range. This range is a better producer of forage than the other ranges because of the quantity of brush upon it. It is the first to recover from overuse. This range blends into the summer and winter ranges so completely that plans for those ranges are all that are necessary to build up and maintain it.

Food Supply on Winter Range. The whole layout of the west side winter range is ideal for deer. The land slopes gradually down from the summer range, with numerous arroyos, or draws, extending westward. The exposure is westward, and snow lies on the north slopes while the south slopes are mostly bare. These south slopes produce late winter grass which deer eat to a considerable extent while it is fresh. The crookedness of the draws affords protection from wind from any direction. In the past there has been a most wonderful growth of cliff rose. It has been estimated that past abuse has reduced the forage-producing capacity of this range by 80 per cent. At present the greatest quantity production on the area is by sagebrush. But since cliff rose is the more palatable it is used as the key plant. Browsing of cliff rose should not be more than 70 per cent, in order to permit it to re-establish itself on the range. There is plenty of cover on all winter range. The most of the deer winter on the west side. The drift to the east side is not so natural, but quite a number of deer go that way, probably one-fourth of them. The North End winter range is used some, but for some reason there is never a heavy drift that way.

Present Capital Stock.

Animals.

Range count made by the Forest Service, State Game Department, and Park Service, in co-operation, in March, 1933, placed the total number of deer at 16,000. The count in 1932 was 14,000. There was probably a small increase on the east side. Fourteen thousand is the lowest number estimated since 1912. The present number of deer is believed to be about right for the forage produced on the range. The present number is below carrying capacity. The number must be kept below carrying capacity for a time to enable the forage plants to come back.

Procedure.

Number of Animals. Deer management must be such that the numbers are

always within the food supply and that the food supply is not diminished by overgrazing. There must be adequate control so that numbers may be increased or decreased as the varying conditions demand.

While range condition is the measure for determining whether there are too many or too few deer, a definite number must be assumed as the total number in the herd, which number will be used as a basis for determining annual increase, amount of surplus, and fluctuations in total.

Winter counts to determine the total number of deer will be made at such times as snows are heavy and deer congested into the smallest area, usually in February or the first of March. These counts may be made annually or biennially, and should cover enough of the area to get a good estimate of numbers. They should take into consideration the following things:

Range visibility at which deer can be counted.

Weather conditions—whether stormy or fair.

Area actually counted, and per cent of deer on that area that it is possible to count.

Extent of area over which deer are distributed at the time, and possible congested areas.

Possible duplication of count.

Estimate of total herd.

Summer counts will be made through VT Park (DeMotte), in the evenings twice a week all summer. This Park is in the heart of summer range. By this count we get a check on fluctuation of the number of deer in the herd, percentage of yearlings coming into the herd as increase, percentage of fawns born in the summer, and ratio of bucks to does, and best time of day and time of year for travelers to see deer. Spring and fall counts will be made at times on various other areas as a check on these summer counts.

Studies. Range management studies are being carried on by a Junior Range Examiner. Refer to plan for "Biological and Game Management Studies," and yearly progress reports. The objectives for such studies are as follows:

1. Determine the Carrying Capacity of the Range.
2. Determine the Relationship of Grazing between deer and Domestic Livestock.
3. Determine the best methods to Improve the range.
4. Life history data on deer.
5. Determine the special conditions and management necessary for the best enjoyment of the deer by the people.

Range Inspections. Inspections of range will be made during the growing season and records made of the amount of annual growth. Inspections will be made at the end of the grazing season and records made of the amount of browsing that has taken place. These inspections will be made on all seasonal ranges and by them the supervisor will keep informed of the trend in range conditions.

Recreation. The Kaibab National Forest is a very important recreation area, and one of the first things to keep in mind in formulating a deer management plan is to preserve the deer in the mountain meadows as an attraction to visitors.

Recreation centers should be so located that they will interfere as little as possible with the habits of deer. Springs and waterholes should not be monopolized to the exclusion of deer.

Special Uses. Special use permits for camps, range improvements, etc., will not be issued for locations where there will be serious interference with watering places of deer.

Timber. Deer seriously injured timber reproduction in past years. They must be kept to a number that timber will not be seriously injured. Timber reproduction is encroaching into meadows and open flats in certain places. Serious consideration should be given to this, with a possible solution by cutting out the reproduction from such places and retaining the meadows and open places as congregating places for deer, and for production of deer feed rather than timber.

All management plans for the timbered area must take into consideration the welfare of the deer, and plant cover and watering places must be protected.

Domestic Stock. The grazing policy in relation to Domestic stock is outlined in letter G—Allowances of December 3, 1929.

Removal of Surplus. In past years various methods of removal of surplus have been tried. Fawns have been caught at time of birth and raised on small farms and disposed of in the fall to applicants for parks and private grounds. Wild deer have been trapped and transported alive to other game ranges. These two methods may serve a useful purpose, but they can never take sufficient numbers to control the increase.

Sportsman Hunting. One of the reasons for the management of the Kaibab deer herd is to furnish good sportsman hunting. This is also the most effective way, known at this time, to remove surplus and control increase. Supervised hunting is done in co-operation between the Arizona Game and Fish Commission and the Forest Service. Camps are established on the intermediate ranges and certain hunting areas designated. Lines are so drawn that the sections along the Grand Canyon Highway and a large part of the summer range are kept free from hunting.

All plans for elimination of surplus should be made to remove both bucks and does, and not to remove bucks only. It is desirable to maintain a larger proportion of bucks than is needed for breeding purposes because bucks add to the summer attraction, and because many bucks also add to the thrill of hunting.

In deciding the number of deer to be removed each year, the following things will be taken into consideration:

Percentage of yearlings coming into the spring and summer range which

will be added to the total number of deer in the herd.
Condition of the range plants after seasonal grazing.
Whether numbers should be increased, decreased or held stationary.
Possibility of natural losses and predatory animal losses.

Decision for fall removal of numbers by hunting should be made in June, in conference with the State Game Warden.

EXAMPLE: In March, 1933, the estimated number of deer was 16,000, of which number 18 per cent were yearlings. Spring and early summer counts showed the number of yearlings that would be actually added to the herd to be less than this, or about 15 per cent. It was assumed that 2,400 yearlings would be added to the herd in 1933. It was decided that any number from 800 to 1,400 deer could be taken by sportsmen hunting and leave at least 1,000 yearlings to fill into the herd to cover losses due to old age and predatory animals. The object being to hold the herd to the present number without increase or decrease. Numbers can never be absolute when dealing with wild deer on open range—they are always estimates—and therefore there must always be leeway when fixing them.

Coyotes. Coyotes should be kept to a minimum by trapping and hunting for furs. Poison is not to be allowed because of the possibility of destroying other wild animals, including the Kaibab squirrels, as well as lion hunters' dogs. Trapping permits are issued to local trappers, giving each one a certain exclusive area on which to trap. Each trapper is required to hold the necessary state licenses, and to report to the Forest Supervisor the size of his catch.

Mountain Lions. Lion hunting is a popular sport, although expensive, and is enjoyed by a number of people. The number of mountain lions will be controlled by sportsman hunting. This method has been very effective in the past. Mountain lions should be kept to a number where they are always under control, but they should not be exterminated.

Salting. During the past ten years from six to ten tons of salt have been put out annually. Of the quantity put out, it will be distributed as follows:

Summer Range. Out in June, 40 per cent.

Winter Range. Out in November, 40 per cent.

Spring and Fall Range. Out in September and November, 20 per cent.

Certain grounds may be used more than others, and these should have additional lumps dropped on them if they become dry. Lump salt is used—either the pressed block or natural lump. The natural Utah salt is preferred because it stands the weather better and also contains certain minerals which may be beneficial to animals.

Co-operation is had with cattle men in salting so that they put salt on certain grounds and the Forest Service salts certain grounds.

REVIEWS

The White-Tailed Deer of the Adirondacks: Roosevelt Wild Life Bulletin, Volume 6, Number 2.

This bulletin is essentially an ecological study. It contains a great deal of valuable material, but leaves many questions unanswered that are essential to management. Two of the authors, Townsend and Smith, spent three summers in the woods observing deer in their natural habitat, and the third, Spiker, spent two late winter and spring seasons on the study. Their observations are detailed and accurate insofar as they go. They record the habits of the deer, their numbers and food preferences, but make no attempt to estimate carrying capacities.

The most important fact brought out, from the management viewpoint, it seems to me, is that deer are essentially a "forest-edge" animal. They seldom go far back into the forest or far out into the open. The white-tail does not range so much into the open as the mule deer. One's first thought is that the forest is for shelter and the open for food, but the facts seem to be that the "edge" itself is best for both. This means that the type of plants growing in this transition zone furnishes deer food in greater quantities than either the open areas or the deep forest, and also that its dense brushy growth furnishes the best cover.

There are apparently three principal types of forest edges in the Adirondacks, one natural, and two produced by man. The natural edge environment is found along the border of lakes and swamps; to some extent along streams also, but streams are mostly small, with no distinct border. The second common edge environment is that produced by clearings for fields and settlements. The clearings for highways seem to be unsatisfactory for this purpose. The transition from field to forest is too abrupt to produce the best in either cover or food, but this is compensated for somewhat by the field crops. Deer are particularly fond of vegetables and fruit, also the buds and twigs of fruit trees.

The third type of edge is that produced by fire—the edge of the burned area. In fact, the entire burned area produces good feed, but it is not used unless there is sufficient timber left for cover. Of course, after a few years cover will be produced, but then in a few more years most of the feed is out of reach. The burned area feed is important, but seems not to be so important as the other two edge types in the area studied. While the application to management is not discussed in the bulletin, I presume that what it means is that if you want more deer you must create more edges.

The second thing that impressed me is the extreme lack of mobility of these Adirondack deer. They stick to the home range, and the home range is not very large. While there is some seasonal movement, following the feed, there is nothing in the nature of a migration. In fact, a deer may spend the entire year within a radius of a mile or two. Its daily range is even more restricted, especially when food is plentiful. It has its favorite feeding grounds to which it returns each day and at about the same time. If undisturbed it

follows closely both a daily and a seasonal routine. It feeds morning and afternoon, visits its customary loitering grounds and bed grounds and follows the same runways between. Near settlements it feeds at dusk and at dawn or in the night. Otherwise it feeds in the daytime, although there are individual variations.

It changes its feeding ground with the seasons. In the spring it goes to the fields or open marsh for the tender grass, early weeds and early swelling buds. In the early summer it visits the lake shore for the aquatic plants that are plentiful and tender at that season. Then it moves up on the slope for the fruit and nut season. The early winter it spends in a burned area, going down into the cedar-hemlock swamp when the storms become severe and the snows deep. All of these feed grounds may be in one small watershed. Where forage is less plentiful the home range may be more extended, but apparently a deer seldom leaves the home range even when the food supply is exhausted.

Some very careful population studies were made, but no direct attempt was made to locate the cause of the differences. The lowest count gave only one deer to each six square miles, the next, one to each square mile. The first was not an intensive count. Both of these areas included settlements. The highest intensive count gave 12 deer per square mile. The average was about seven. The low population adjacent to settlements may be due to a number of causes. First, it is much more difficult to get a correct count. Deer adjacent to settlements becomes a nocturnal animal. It hides through the day in the densest cover and is seldom seen. Next, these areas are most heavily hunted, and last the disturbance, if not actual killing, by dogs. It is stated that deep snow is the only natural enemy the deer have left, and since the snow is no deeper here than elsewhere, it must be man that holds them in check. Yet deer is the only big-game animal that has adapted itself to living on the borders of civilization. Where predators exist the deer seem even to favor the settlements.

These counts were all made in accessible areas where hunting is heavy. In remote areas seldom penetrated by hunters "deer have increased to such an extent that a crowded condition exists. A very good example of this situation may be seen in the West Canada Lakes Region, of Hamilton County, where deer are present by hundreds." On a three-day trip into one of these remote areas in the late winter, 76 starved deer were found. Only 28 of these were fawns. The others were of both sexes and all ages. This count is an indicator of the enormous losses that must occur. It illustrates also the fact, sometimes lost sight of, that deer populations must in some manner be held in check, if not by hunting then by starvation or predators.

The discussion of feeding habits and food preferences is the best I have found anywhere. The deer, it seems, will eat anything, that is, any plant, either water or land. It will eat fruit, stem, leaf and root. When food is plentiful, however, it is particular. It likes variety, but shows decided preferences. These preferences vary with the season. Among the evergreens, it prefers cedar (*Thuja*) and cares least for spruce. It browses most of the hardwoods, and seems to favor mountain ash, aspen, sarsaparilla and maple. It likes gardens

and apple orchards, and seems to relish all field crops. It eats grass, but from preference only when young and tender. The following partial list of food plants seems to be arranged in order of palatability, although this is not definitely stated: Wild red raspberry, wild blackberry, sarsaparilla, algae, pond lily, deer grass (*Eriocaulon*), witch hobble, mosswood, bracken, poplar, choke cherry, maple, elderberry, nettle, beech, birch, laurel. The food supply is everywhere plentiful in the summer, and is sufficient, except in unhunted areas, for the ordinary winter. In severe winters the loss is heavy unless feeding is resorted to. It is the custom to feed the deer on most of the large private estates.

New York has a buck law, and the area where the counts were made is heavily hunted, but in spite of this, the ratio of does to bucks is only $2\frac{1}{2}$ to 1. The highest ratio found was 5 to 1. While it is illegal to kill does, the guides of the region, as well as many of the natives, claim that as many does are killed as bucks. Hunters shoot, and determine the sex afterwards. The does are used for camp meat or left in the woods. The ratios indicate that a considerable number of does must be killed either through accident or poaching. The counts indicate also that three-fifths of the mature does have fawns. This is probably a mistake due to the difficulty of determining whether or not a doe seen at a distance has a fawn or not. There was considerable chance for error. Also, according to their observations, one fawn is the rule.

Pneumonia seems to be the one disease causing perceptible loss, but even this scarcely ever afflicts well-fed deer. The most common accidents are from cars and trains at night. However, the total loss from disease and accident, when expressed in per cent, is very, very small.

As I said before, the bulletin is not a management study but an ecological study. However, it does furnish many of the basic facts needed in management. The bulletin can be had, I think, from any Regional library. Whether you have white-tailed deer or not, you will find it well worth reading. You may find also that the work therein described suggests to you things that you may do or have done on your forest or district.—P. K.

The Pennsylvania Deer Problem: Bulletin 12, issued by the Board of Game Commissioners, and Bulletin 50, by the Department of Forests and Waters.

The deer problem as discussed in these two bulletins is not the usual one of protecting the remnants of waning deer population against the devastating instincts of man, but that of protecting a vast and consuming hoard of deer against ultimate self-destruction. The deer population of Pennsylvania is estimated at 800,000, with a food supply now adequate for probably one-fourth that number. But the food supply is decreasing. What is to become of the deer? That, briefly, is the problem. Bulletin 50 is interested chiefly in its relation to forests and forestry, while the purpose of Bulletin 12 is to instruct the people of Pennsylvania, and get them to realize the seriousness of the situation from the game point of view. For "to convert, within a single generation, a shot-

out eastern state into a state overflowing with game, was a simple problem compared with this problem of feeding and controlling certain species of this game now that we have it."

The white-tailed deer is today Pennsylvania's best known and most plentiful game animal. Thirty years or so ago it was practically becoming extinct; to see one in its native environment occasioned considerable comment. In 1905 the first refuge law was passed. Before that, hunting with hounds had been forbidden. In 1907, the first "buck law" was passed. Then followed law after law for further protection. By 1915 the wonderful comeback of deer in Pennsylvania had won the admiration of the Nation, and was pointed to by game enthusiasts as an example that other states might well follow.

But by that time complaints by farmers began to come in. These were given little credence at first, but persisted and increased until an examination was made. Then "how quickly the problem of the Board changed from one of saving the deer herd to one of adequately controlling it." In 1923 the deer-proof fence law was passed. This law provides that the state will furnish the wire and staples necessary to construct fences for the protection of orchards and fields, the farmer to furnish the posts and do the constructing. In the same year protection was removed from does in sections where depredations were worst. Landowners were also given the right to kill deer actually engaged in destroying crops or orchards. In 1926, five thousand does were killed in some of the more congested areas. The next year they tried a law which permitted the killing of very old does. All these methods were ineffective, so in 1928, in spite of a great deal of opposition from game associations, the season was opened on antlerless deer. Only 25,097 were killed, and this kill was not properly distributed to give most relief. Its result was an increased fawn crop, not a reduction. For a little more than twenty years the Board directed its efforts toward protection and increase; for thirteen years now it has worked for control of numbers, with no relief yet in sight.

Of course, the great difficulty is with overgrazing. If there were more feed there would be no objection to more deer. But no matter how much feed they had, there would soon come the time when the deer would have caught up. They now have 800,000. With sufficient feed and perfect protection, they would have 6,000,000 in five years. Then the control problem would be greater than ever. By some method numbers must be controlled. At present starvation contributes most to this end.

Bulletin 50 gives most attention to the food supply, but chiefly from the damage point of view. In some areas the forest is severely damaged. Planting operations are at a standstill, since plantations were being destroyed. Natural reproduction is also impossible. Some old burned areas are almost completely barren. Good productive land is being turned into waste areas. "Areas in the State Forest, which even as late as fifteen years ago contained a ground cover of grass, weeds, briars, and scrub growth, are now devoid of this type of vegetation." Large areas are described as barren. In areas where the forest got the start on the deer and got up out of reach, all underbrush is killed out and every

sprout and twig below the "deer line" is taken.

In such overgrazed areas no such thing as palatability is recognized. The deer eat everything. Even poisonous plants are overgrazed. In Pennsylvania there was once great quantities of rhododendron and laurel. Where feed is plentiful these plants are scarcely touched. In the congested areas they are rapidly being killed by heavy browsing. Without deer control the foresters do not seem to think that forestry can be a success.

In the Adirondacks bulletin a good deal of emphasis was given to water plants and the feed around lake borders; in Pennsylvania more emphasis is placed on fruits and nuts. The chestnut was once a very important deer food. To replace it the Commission is planting large numbers of Japanese chestnuts and chinquâpins. They have also planted large numbers of shrubs and vines. The difficulty with this form of relief is that in the areas where feed is needed most the plantations have not a chance. They are completely destroyed by the deer.

Two other methods of increasing the food supply have been suggested. The first is to go into stands where most of the feed is above the deer line and cut out the mature aspen. This cutting would be done in the late winter, when food is most needed. The tops would furnish an immediate supply that would tide the deer over the critical period, and the new sprouts from the stumps and roots would furnish food for several years to come. The second method is burning. While this method would increase the food supply for deer, it is not known just what it might do to the food supply of other animals. Furthermore, it would be destructive to all forest values and to the soil. Then, too, an increase in the food supply without control of numbers is at best only temporary relief.

The great difficulty is that people in general cannot understand how great the natural increase is. The fawn crop should be 250,000 to 300,000 each year. It is actually, due to poor nutrition and an unbalanced sex ratio, not more than half that. The legal kill is 22,000 and 25,000. The people insist on protection. This forces "nature" to make the necessary adjustments. Nature's method is effective but wasteful. While a number of studies have been made, no one has published an estimate of the number that starves, but it must be close to 100,000 each year.

Another method used by nature in the control of numbers is disease. This has been expected, and an attempt is being made to guard against it. So far the deer herd is healthy. Sometimes the weakened deer actually succumb to disease rather than starvation, but the well-fed deer are not affected. There are, however, some noticeable changes taking place. One is the poorly developed antlers among numerous young bucks. Another is the increased number of freaks, the most noticeable of which is albinism. The most important change is the derangement of the natural and normal breeding season. Fawns are now born all summer long, while normally they come in May and June. This is supposed to be due to the abnormal sex ratio. The ratio of bucks to does is estimated at 1 to 10 for the state, but in some places it is as low as 1 to 40 or 50.

The most surprising thing about the Pennsylvania situation is the unevenness in distribution. One who does not know deer habits would expect the deer to spread out over the state in search of food. This they do not do. A deer stays on its home range, food or no food. Every year deer starve while there is feed in plenty within less than a day's travel. The congested areas stay congested while the understocked areas stay understocked. The 25,000 killed during the open season may come largely from the non-congested areas.

"As the result of all these facts of observation and experiment, it is unmistakably plain that we must answer two main questions: Shall we reduce our deer herd to the carrying capacity of our range, or allow the farms, orchards and forests of the state to be destroyed, without possibility of compensation—and a pitiful percentage of our young and growing deer die of starvation? And which shall we feed: growing fawns and bucks old enough for hunting, or a host of non-producing does (from whatever cause non-producing)—mere boarders?"

"These two questions, at least, **MUST** be answered, and answered **SOON**."
—P. K.



COMMENTS ON DEER MANAGEMENT

The deer is our most important big-game animal. In addition to its high value as game, it has perhaps an equal value in recreation. Both these values have long been recognized, and a great deal of time and money has been spent on attempts at management. For all of which the deer themselves have been the chief sufferers. In most places starvation is the best we have to offer them. Curiously enough, it is our desire to "protect" them that forces upon them this cruel situation.

However, conditions are beginning to change. In a few places management is being directed to other ends. But it is slow work. Pennsylvania officials have for ten years realized the wastefulness of present methods and have known many things that should be done, but as yet have made little headway. The plan for the Kaibab, together with the bulletins which I have briefed, seem to me to give a fairly good cross section of the present stage of deer management in the United States. The fact that the better condition is on a national forest should not be construed to mean that this is universally so. On some Forests, I understand, conditions are not so good. The Forest officers, like the Pennsylvania officials, have difficulty in getting done the things which they know should be done. In the meantime the deer "crop" (legal) is about one-tenth what it should be, and deer in enormous numbers are starving, are being fed to the coyotes, or are being taken illegally. The important fact brought out in all three of these discussions is that deer by nature increase, and that this increase must and will be removed, if not by man, then by nature. While the Adirondacks bulletin did not deal with management, it does give considerable insight into how management is carried on.

In an earlier lesson I gave you Leopold's definition of game and his objective in management—"game in the bag," or rather, the "sport" incident thereto. I also gave you his "factors," which he tells us the game manager "manipulates" in his efforts to reach his objective in management. Since reading his discussion on the manipulation of factors, I have fallen into the habit, whenever I read an article on game, of checking it against each of these factors to see which are manipulated and how, and in what way the results contribute to the objective. This is particularly interesting when applied to the Bulletins reviewed and to the Kaibab plan.

In the first place, consider the objective in management. In Pennsylvania for the first twenty years they had a false or misleading objective. This caused them to make wrong moves and to neglect some important factors. They were working for numbers. This caused them to concentrate on restrictions to hunting and the extermination of predators. They got numbers, but also got into all sorts of difficulty with most of the other factors. Their objective now is to control numbers and build up the food supply. Hunting is still restricted, not controlled. As a result they still have understocked areas, while starvation harvests a bigger crop than the hunter.

In the New York area conditions are much the same. In the lightly hunted areas the number of deer far exceeds the food supply. In the heavily hunted areas all factors seem well taken care of. Hunting is restricted to a season and to bucks. The numerous well-distributed "coverts" prevent the hunters from getting too many or distinguishing too closely as to sex. Two areas seemed understocked, and from that there are all gradations up to badly overstocked. While the hunting factor is manipulated it is certainly not controlled, and while they apparently have not made the mistake of establishing refuges, they still have from natural reasons the same unsatisfactory results. On the private estates management is more intensive, but the results are not given.

The Kaibab plan gives us seven objectives. Number one gives their two-fold purpose—the satisfaction and the pleasure that visitors get from seeing wild deer in their natural surroundings, and the sport they afford to hunters. Number seven states that deer management must be correlated with other uses. The others relate to various factors bearing on these two.

Number three gives as an objective the building up of the range. Just why they want to build up the range is not discussed. They apparently now are furnishing all the hunting there is a demand for, and the tourists all get to see deer. One judges that the demand for hunting is not great by the fact that predators still get more than half the crop. The fawn crop from 16,000 deer would be something like 3,500, yet the yearlings number only 2,400. An additional thousand is allotted to the predators, leaving only 1,400 for hunting. When the demand for hunting can be depended upon to remove the surplus, the predators can be reduced, but it would be dangerous to reduce the predators if the hunters are at all uncertain.

A great deal of attention is given to the food supply. With no method of measuring it, they attempt to control through the amount of utilization of key

species. This appears satisfactory, but its application needs study. This the plan also provides for. It is the best balanced range I have ever heard of, and is higher than the average in carrying capacity. One deer to forty-five acres is not bad, yet the plan looks to increasing this. It mentions increasing by "artificial means," but does not directly provide for it. In fact, my impression is that the capacity of the summer range is actually decreasing, and will continue to decrease until they do resort to some form of artificial (if one may call it that) manipulation. The plan states that, "Timber reproduction is encroaching into the meadows and open flats in certain places. Serious consideration should be given to this . . ." My hunch is that the local Forest officers would like to do something more than just "consider." The coniferous timber has only a recreational value. It furnishes little feed. The deer, too, have recreational value. What combination produces the greatest total value? But we, as foresters, are prejudiced against destroying timber. We protect it even when it destroys greater values. In that I wonder if we are not something like the game enthusiasts, who insist on protecting deer on overstocked areas.

The Kaibab plan does give some consideration to all factors. For example, it provides for the distribution of salt, 1¼ pounds per head. Mostly this is neglected even when it is recognized that salt is needed. It also recognizes that numbers must be controlled. So it goes easy on predators and actually controls hunting. It recognizes also that deer must have feed, so it provides for range inspection as intensive as is usually found necessary on range for domestic stock. It recognizes the possibility of disease, and provides studies looking to early discovery and prevention. It looks out for water. It says that cover is sufficient, and provides for keeping it so. All in all it seems to be a pretty good plan. The Board of Commissioners in Pennsylvania are working toward the same sort of control, but they are badly handicapped. I wonder on how many Forests are we building up for ourselves the same sort of handicaps.—P. K.

SUGGESTIONS FOR DISCUSSION

"It appears that our deer herd is, in a sense, assuming the same dependence upon us for proper management as does a herd of livestock." This is another quotation from the Pennsylvania Board of Game Commissioners. It expresses, I think, pretty well the situation on the National Forests. We have the deer, millions of them. They are dependent upon us, since we control the land on which they live. Also we control their food supply. They respond readily to management, and can be managed with almost the same precision and regularity of procedure and results as a like number of range cattle. Additional information on food requirements and habits is needed, but enough is known for successful, fairly intensive management.

The demand for deer is pretty generally expected to increase. Will we be able to meet this demand? Admittedly there are a good many handicaps. The demand is frequently highest where opportunity is poorest. On some areas the supply is now far in excess of demand. State laws sometimes do not harmonize with management requirements. Laws apply to States, while management regulations must apply to unit ranges. Management requires control of the removal of the crop. One range may be understocked while the adjoining range is overstocked. The old idea was that the deer would spread out and equalize themselves according to the feed. This they do not do. The surplus must be removed from the individual range where it exists. Overflow is negligible. This greatly complicates management.

The greatest handicap of all is the people themselves and their lack of understanding, and the misinformation and part-information put out by game enthusiasts. This is well illustrated by the Pennsylvania Bulletin referred to elsewhere. Through public demands mistakes are perpetuated. Refuges are retained as refuges long after they are eaten out and all food destroyed.

But if the job wasn't difficult there would be no need of our discussing it. It has to be done somehow, so what is the best method of doing it? We have the nine factors to manipulate. Hunting is the most difficult. What can be done about it? Food supply comes next. The common way to increase feed is to limit grazing use. There are other ways: planting, fire, clean cutting of timber. Will we use any of these? Will we plant evergreens for cover on our too open ranges? Will we feed in winter to supplement the range? And will we destroy the predators in areas where hunting is limited? All these and many other questions have to be answered in one way or another. On almost every Forest there are deer, and deer imply a responsibility for management.

QUESTIONS

1. How about public opinion? Will the public some time have to unlearn the things we are now teaching? Refuges, for example? Or uncoordinated use?

2. Can anything be done about the control of hunting? The crop must be harvested, but control implies something that corresponds to our practice in forestry. We mark the trees, that is, we say what the harvest shall be on each area. How are we going to get this control, or how hasten the time when we do?

3. What weight shall we give to the needs for deer feed? What methods are permissible in increasing feed? Would we be justified in planting either for food or cover?

4. Who has a suggestion for marking deer under observation so that individuals can be recognized.

5. All other factors? In other words, can we improve our deer management or are we now doing the best that can be done under existing conditions?

* * *

May we have your discussions by March 31?



DISCUSSION OF LESSON 22—GAME MANAGEMENT

This group of discussions, it seems to me, deserves careful reading and analysis by every man on a game-producing Forest. Not that they solve the problem, but rather that they indicate the problem and the state of our present thinking on the subject. I take it that the subject is causing us considerable mental unrest, with a realization that something is badly wrong with the whole setup and not much idea as to what can be done about it. That is, the public places upon you a heavy responsibility but denies you authority; they demand the impossible without realizing how impossible it is.

What seems to be necessary is that the public become informed on what game really is, its relation to the land, and its own inability to control and force the production of game on somebody else's land. But why expect so much of the public when we ourselves, as one discussion states, are just beginning to realize that game animals actually eat. The old frontier idea that game comes from the bounties of nature, costs nothing and belongs to whoever can take it, still persists. Before management can progress very far there must be a realization that game is a product of the land, that its production, like any other crop, has its costs, for which the producer should be compensated. As one paper says, there is need for "sifting the facts from the fancy." But I wonder if you realize what a big job that would be; it is almost impossible to distinguish between an accepted idea and a fact.

The Senate Committee idea that we need specialists is accepted, but there is a difference of opinion as to what kind. Some think a biologist and some a manager. Personally, I cannot think what use we have for a biologist. True, he could write some reports, but why not let the Biological Survey experts do that? I favor the manager idea—a man who will start putting plans into effect. True, we do need more information on the food requirements of a number of game animals, but why cannot a ranger get us that information as well as a biologist? Why not put it in his work plan and find out?

Disease worries some of us, but as far as reports go disease is not a serious handicap except for the cyclic species. The Biological Survey experts should be able to handle the disease situation.

One paper mentions the "demand" for game. This question probably needs as much study as any other. Where is the demand? It seems to me that the supply now far exceeds the demand in many areas. In the Adirondacks there is an oversupply of deer, except for the most accessible areas. The same is true for Pennsylvania, and for the Forests in Arizona. Even on a Forest so well advertised as the Kaibab, they must depend on predators to remove a part of the surplus—the crop. So why get excited about intensive management in the back country where an oversupply probably already exists. It's like making a fuss over high stumps on a forest with a market for only one per cent of its normal growth.—P. K.

WELLS THURSBY

MANTI

EPHRAIM, UTAH

Game Management is at present in about the same place that forestry was 25 years ago. It is groping around for something to hold to, not able as yet to stand alone, and not able to do things that should be done. As it grows, proper things will be done.

Enough about game management is already known to more than use up all available time and money. At present, the easiest and least costly matters are being taken care of. Matters that dovetail with other industries. For instance, control of predators, such as coyotes, lions, etc., is a part of game management which dovetails with the production and management of livestock. Game management is not big enough yet to take these matters alone. A factor of game management, such as "Hunting," is, of course, far ahead of all other factors, because it shows direct returns through license receipts. Other factors do not show direct returns, and are therefore slighted.

The factor most needing attention at present is "Starvation." To manipulate this factor in accordance with our knowledge of its importance takes money. Many of our big-game animals have no winter range. Many of our birds starve during the winter. We know this, know how to manage it, but it not being a direct bearer of receipts it is slighted. Improvement in the manipulation of other factors influencing the management of game will come as the "Starvation" factor is perfected. Money is the thing that holds game management back, not a lack of knowledge of things which should be done.

I think that all factors can and are manipulated under National Forest conditions. As the forests are managed for livestock grazing so are they managed for game grazing, indirectly. Predators are fought for the protection of livestock, and at the same time protecting game. Game is of secondary importance. Disease is fought on the National Forests for the protection of livestock, and thus the factor is manipulated in game management.

It is certain that we need a lot of information about each game animal to properly manage for its environment. The habits, diet, enemies, diseases of each should be known. It is also certain that we now have a lot of information that could be but is not used to advantage.

If two factors were properly manipulated at present, game management

would be a long way on its road to perfection. These factors, "Predators" and "Starvation," we are not in the dark about. We have enough information on each to be able to manipulate rightly.

C. S. ROBINSON

SANTA BARBARA

SANTA BARBARA, CALIFORNIA

Mr. Keplinger is right, indeed, when he says that "to do the things they know should be done forces them (us) to slight other duties." This, I believe, is what is responsible for our lack of progressive thought and action in fish and game matters.

The question of ownership is also important. We cannot plan completely for betterment when final decisions rest with the State authorities, who, by reason of their dependency on license fees, are bound to consider costs first.

We do not need research or specialists so much as we need *managers*—someone who is able to watch for "limiting factors," and who can devote time to intelligent observation. It should be the duty of these men to observe and report simply, actual conditions and to work out practical solutions for local problems. This would, of course, be supplemented and assisted by the knowledge of other Forest Service officers. By this method we would make a good start towards the building up of a game management plan for each forest that would meet its individual needs. Elaborate schemes or plans calling for everything at once should not be allowed, for we have too often permitted ourselves to be drawn into a maze of plan formations only to have the main issue clouded and interest lost by the individual who has to do the work.

The two most important members of our wild-life population are deer and fish. Small fur-bearers are in greatest need for immediate protective action.

Answers to questions suggested on Page 17 are listed in order of importance as follows:

1. (a) First is *food*, which is fundamental for any successful manipulation. If the food supply is scarce no "management plan" can materially change the game population. The food supply is the greatest single factor that can be successfully handled under normal forest conditions.

(b) Hunters are the most important killing factor in Region 5, with predatory animals second. Bag limits and season based on knowledge of fish and game conditions can be worked out one year ahead by the Service in cooperation with the State authorities; however, the final decision should rest with the Forest Service. This is imperative in dealing with trappers and trapping.

(c) Private lands inside the forest might be a difficult matter, but a waiver similar to that used in grazing management could be secured.

(d) Ownership of fish and game within our boundaries is advisable if only to enable us to discover and demonstrate what we believe can be done to improve present conditions on the lands under our immediate supervision.

2. The best way to handle this is to follow mainly the objectives of Grazing Reconnaissance.

(a) Life history of species to be studied.

(b) Type of country best suited on basis of year-long or seasonal use by natural selection.

(c) Forage requirements. A brief list of principal browse, weeds, and grasses, with value ratings, can easily be made up that will serve as a basis for estimates of normal stocking.

In my article published in the Journal of Forestry, April, 1931, "Feeding Habits and Forage Requirements of Deer in the Sierra Nevada Mountains," and again in the Service Bulletin of April 11, 1932, "The Importance of Wild Life Resources in Plans for Forest Administration," I attempted to point out the need for active participation and leadership by the Forest Service in plans for land management that would place our animal crops on a sustained yield basis.

F. B. AGEE

BIGHORN

SHERIDAN, WYOMING

Practically all of the factors mentioned as affecting game can be manipulated, some, of course, to a much greater extent than others. Hunting and food supply have perhaps received the most attention, but both on the average Forest offer a great deal of opportunity for further manipulation.

As is brought out in almost any discussion of National Forest game conditions, winter food supply is usually the controlling factor as to the maximum size of the herd. With elk, and perhaps to a less extent with deer, there are usually only limited areas of winter range within the Forest, and most of such range outside has passed into private hands. This, of course, limits the opportunity to manipulate the food factor; but I am not sure but that we have been too quick to accept the situation, construct a drift fence to protect the remaining winter feed, and consider that we have discharged our responsibility.

Often, there are also considerable areas of range adjacent to the winter range suitable for late fall use by game, on which grazing by domestic stock could be restricted to very light use or prohibited altogether, thus leaving a great deal of feed to carry the game through the late fall and early winter months before the snow forces it down on the winter range. Whether use commences in November or January makes a great deal of difference in the number of elk the winter range will support. There is usually opportunity from time to time for minor adjustments of this kind between domestic stock and game which afford opportunity for building up our game population without serious injury to the livestock users. We can probably go a little further in manipulating factors so as to leave our present winter areas exclusively for emergency use during the extreme winter period, or during the extreme winter.

Although the expense of opening up dense stands of young timber to improve game environment may not be warranted, yet the expense of thinning

the timber for improvement of the stand may be justified under present conditions, and a little incidental attention to reserving the occasional aspen or other broad-leaf trees or shrubs may do much to improve feed conditions for deer. Also, oftentimes a careful weighing of game and domestic stock values in determining the actual location of a drift fence may result in a small piece of range with feed and cover conditions exceptionally well suited to game being placed on the protection side of the fence. I think, however, there is more of this conscious manipulation taking place than the author appreciates.

Hunting, or harvesting the yield, has come in for a great deal of attention, but usually in the form of certain areas reserved from hunting, and in the form of open seasons fixed in advance, which, if weather conditions prove favorable to the hunter, result in harvesting a great many more than the yield, or a great deal less than the yield if weather conditions prove favorable to the game. The Commission form of game administration, in many States, has done much to add flexibility to this phase of game management; but usually their authority does not empower them to change seasons without advance notice nor to take other action to meet emergencies. Limiting hunting licenses to the number of animals to be removed, with less attention to seasons, and in particular less attention to closing areas, which tends to cause too heavy concentration on parts of the range, is, of course, the ultimate solution. This is more a problem of dealing with people than with physical factors, and the things brought out by the author in his recent discussion of Range Management apply equally here.

Rush, in his studies of the Northern Yellowstone Park herd, brings out the tendency towards increase in disease—Sarcocystis, lungworms, stomach worms, Bott fly larvae, tapeworms, etc.—where large numbers of game are concentrated on limited areas. Occasional manipulations in territories open and closed to hunting has a tendency to keep the herds scattered over a greater area, with attendant safeguards to the health of the herd, and usually with more natural feed available to it. Here again, however, it is more a problem of dealing with people than with physical factors.

While hunting and food conditions have come in for most of the attention in the past, there is a big opportunity for increasing the yield from our present herds through better control of their predators. I know, with the Bighorn deer herds, a rather intensive study, with the help of the officers of the Biological Survey, of losses from coyotes and other predators prior to deer reaching the yearling age showed that the coyotes were harvesting about as much of the yield as the sportsmen.

All things indicate, therefore, that there is a rather big field ahead for intensive game management on the National Forests, and an opportunity to do more towards meeting the demand for this form of diversion. One of the things that is holding back progress at this time is the lack of more complete information on the habits and environmental needs of game animals and game birds. As the author brings out in his discussion, there is not a great deal of literature dealing with this subject. Also, with game more than with other

things, there appears to be a tendency to mix fancy with facts. I know, in recently delving into authorities to ascertain what natural feeds were favorable to Mountain sheep, I found one authority of some standing stating that they ate only the most delicate and succulent flowers of the moist mountain meadows; while another authority, with several stomach analyses to back him up, stated that they subsisted largely on mountain mahogany and other shrubs common to dry canyon walls. The whole problem is one in which Research agencies can help much through determining facts and making them available to those responsible for game management.

J. V. LEIGHOU

GUNNISON

GUNNISON, COLORADO

In the preparation of game management plans we have been confronted with the same situation and the same problems as outlined in the article by Mr. Hill, that is, a lack of knowledge.

It appears to be rather difficult to get any authoritative text on either game or game management. Very little is known, apparently, about even the habits of game animals. This is apparent, particularly when articles appear in current literature regarding whether this or that animal sheds its horns.

The difficulties are further complicated by our apparent lack of knowledge regarding the number of game animals that are on a certain given area. We have estimates year after year of the game animals present on the Forest, and they are merely broad guesses. After such estimates are made for several years we suddenly discover that some game animal is practically extinct, or that we have two or three times as many as we formerly supposed.

The main difficulty in the preparation of management plans for wild life is, of course, the lack of means to put any management plan into effect. Such control measures as are available have so far largely rested with the State Game Departments.

There can be no question of the value of Forest areas for game and recreation that goes with it. We, no doubt, have many areas within the Forest that are really more valuable for game and watershed protection than they are for grazing, particularly when we consider the small amount of profit that is ordinarily derived from the raising of livestock. It is going to be necessary, however, to determine what the normal needs of game animals are, and then if we are really going into the proposition of game management we are going to have to modify our other uses where they conflict so as to at least take care of the more urgent needs of game animals, since it will no doubt be necessary to definitely close to grazing many of our low ranges where they are heavily used as winter ranges. In order to manipulate and improve the environment it will be necessary, of course, to know what the environment and food requirements of the various game animals are.

C. L. VAN GIESEN

ROOSEVELT

FORT COLLINS, COLORADO

There is one important factor of game management which is not covered

in the papers and reviews. I refer to the nation-wide depredations on our game known as poaching. This factor includes all killing of game which violates existing game laws. On this Forest, where there are several hundred year-long residents and many thousands of recreational visitors, the influence of this element on game management is very important. Economic conditions during the past few years have made the poaching situation more acute. Hundreds of deer are killed each year for personal use and for sale. In most cases the **poachers** are irresponsible, and often destitute. Punishment of these offenders is difficult. In one instance which came to our attention a year ago, a man with **a large family was arrested and convicted** of illegal deer killing. He admitted killing 12 deer during the previous winter. During the time he was serving his jail sentence the county had to support his family. He made the statement that both he and his family fared much better than if he had not been apprehended. In view of the wide difference between the legal hunting factor and the poaching factor, I believe that the latter should be included as one of the decimating factors.

Before the Forest Service or any other agency can make any great strides in game management, it will be essential to conduct considerable research work. Separate studies should be made of each kind of habitat for all species of game animals. We cannot hope to plan intelligently for a better food supply if we do not have a definite knowledge of feeding habits. It would also be useless to provide coverts unless we know the type of cover most favorable for the species to be protected. In other words, it will be necessary for research to lead the way in any intensive game management.

J. W. HUMPHREY

MANTI

EPHRAIM, UTAH

1. I am wondering whether or not Leopold's definition of management is absolutely correct. When a range is fully stocked with game, when it is producing to its maximum capacity, then management should aim only to maintain present production and not to increase the yield of the game in the bag, since that would be an impossibility.

Most of the nine factors enumerated can be manipulated under normal forest conditions for continuance of present numbers of game animals where ranges are now fully stocked. They can also be manipulated for the increase of numbers where ranges are understocked. This manipulation will vary, of course, between the different factors: Hunting can be controlled, predators can be destroyed, supplemental feed can be provided, perhaps to a limited extent; diseases may be partially controlled by providing some of the things game require, such as salt, other minerals, and perhaps drugs that will aid in reducing intestinal parasites or other ailments suffered by game animals; such treatments, however, are limited to the remedies that can be fed with salt or supplemental feeds. The water supply can often be provided or improved; even the mortality due to accidents can be reduced a little. Barbed wire fences destroy a few deer each year by their jumping between the top wires and hanging themselves in such a way that they soon die. By replacing with net wire or

rail fences, such losses could be eliminated. The really important factors that can be manipulated are food, control of hunting, and the destruction of natural enemies, such as predatory animals. Where there is a plentiful supply of food, diseases are usually less virulent.

I wonder if the greatest problem in game management is not the control of numbers rather than the purposeful manipulation of environmental factors for the increase of numbers. It was on the Kaibab, and the same is true for this Forest. As mentioned in the lesson, deer will increase very rapidly, and the same is true for the elk, where conditions are favorable.

For those forests where game animals range year long, there comes a time when further increases are detrimental, not only to game, but to livestock as well. I sometimes wonder if public opinion does not react unfavorably to game where such conditions exist.

2. We should know, first of all, whether the ownership of the game is vested in the State or in the Federal Government. We should next determine the carrying capacity of our ranges and the division of forage between domestic stock and game animals. Plans should then be provided to see that both the game and the permitted stock are held to the numbers agreed upon. After that, if the number of game animals is less than the plan provides for, the environmental factors mentioned in the lesson can be manipulated to bring the numbers up to that agreed upon. Where the numbers of game animals are in excess of available range and exceed the numbers allowed in the plan, action to reduce numbers should be taken without unnecessary delay.

Game animals, where conditions are favorable, increase so rapidly that the problem may be upon you before you realize it. Under the present setup, the Ranger must convince the Supervisor that there are too many game. The Supervisor makes his report to the Regional Forester. The R. F. appoints a game expert to investigate. He in turn co-operates with a State official. These two individuals must be converted to the truth of the Ranger's Statement, after which a report is made to the State Game Commissioner. This official must then confer with the officers of various Fish and Game Associations and others, and agreement must be arrived at between the various interests, as to numbers to be removed, methods to be followed in doing this, and a lot of other detail. In the meantime years are passing. The range gets worse, the Ranger does what he can with the stockmen, who by this time are beginning to assume an antagonistic spirit toward game, and openly accuse the Forest Service with favoring game to the detriment of the Livestock industry. Just what the final outcome will be remains to be seen.

Sportsmen of Utah have offered to buy out the stockmen's interests on some parts of the National Forests and hold it exclusively for game. This brings up another question. The stockmen, some of them, might be willing to sell out to Game interests. If they did, however, some of the counties would be unable to maintain their schools and county government, because of the losses in taxable property that they would suffer by such a transaction. Generally speaking, it is in the poorer counties where deer and elk are most numerous,

and where the taxes are derived largely from livestock. The land holdings in these counties would become practically valueless without their cattle and sheep.

The distribution of game is difficult. During the hunting season they are well distributed, but in their drift to the winter ranges they return in the spring to the nearest summer range they are acquainted with. This is usually that part of the range on which injury to the forage is taking place.

W. R. KREUTZER

ROOSEVELT

FORT COLLINS, COLORADO

There is a need for management of the game in the National Forests. We still have game, but how long will this condition obtain if we continue our present and past practices? Where are the vast herds of buffalo? Will the deer, elk and other game animals and game birds fade away like the buffalo and antelope?

We need to know more about the game species and have better counts made during the winter months. We must have more data about the health of game, that is, know the diseases, parasites and what action is required. There is a need for more information about the feeding habits, the condition of winter feeding ranges and the desirable and undesirable plants. A study should be made of the diseases of fish and natural food in our streams and lakes. The adequacy or inadequacy of the food supply should be known, and the action we are going to take to increase the food supply where it is found to be inadequate.

The predatory animal situation should be carefully studied and action planned. Cattle and sheep grazing in relation to game grazing must be given much more careful consideration in the future than has been given in the past. Reductions in the number of domestic sheep may be required to provide grazing grounds for mountain sheep and for the protection of the ptarmigan, and reductions in the number of cattle grazing on the elk and deer winter ranges may have to be made.

The weeding or culling out of undesirable individuals in the herds of deer, mountain sheep, elk, and antelope; the infusion of new blood and the elimination or reduction of losses from diseases are important matters for consideration. The barren doe and the old buck should be carefully selected and eliminated from our deer herds.

The crowding in with domestic stock is undoubtedly having a very marked effect on our game animals in some places.

I agree with the outlines in Mr. Hill's lecture covering the responsibilities of the various groups of Forest officers. Biologists are needed at this time in our game departments. The game wardens should be selected from college graduates and be capable of handling and managing the game situation of the country.

All of this means to me planned sport (fishing and hunting), which in turn demands plans for game management.

I do not like the definition that "game is a wild animal hunted for sport." It is not broad enough. The definition would not apply very well to deer on the Kaibab, where sometimes they would be hunted for sport and would be game, and sometimes they would cross into the Grand Canyon National Park and wouldn't be game. But on the Kaibab and on the National Park there is hunting of deer with a camera, for the sport of the thing but not for slaughter. The definition would mean only that the animals were game after being killed, but were something else while still alive. I like better the following definition of game:

"Game is a wild animal whose species is hunted for sport, meat or furs."

The management of deer on the Kaibab is not for killing for sport alone, but for esthetic reasons, and for natural science studies. If game cannot be given a broad definition, then I am not writing game management plans, I am writing wild life management plans.

Range management in the Forest Service developed at a time when little thought was given to game and when no one thought that game ate anything. In all the years of building up grazing rules not much consideration was given to game, and as a result we are cattle and sheep minded. But game was on the range first. The range originally belonged to the game. Then domestic stock came along and took over the range just at the time the game was being killed off. Now if the game needs the range back again it should not be necessary to buy out the cattle and sheep. Rather, the cattle and sheep have been interlopers during these years, and have been getting something that belonged to the game all the time. If the range must now be given over to the game, domestic stock owners must consider that they have had certain years' use without paying anything but rental, but have acquired no interest in the capital stock, and therefore are not entitled to compensation. When we reduce the number of stock permitted to Jones and give the number to Brown, we do not compensate Jones. When we take an area for a campground we do not compensate anyone for it.

What game management needs most of all right now, in the Forest Service, is for the Forest Service to give it a more important place in range management, and consider it on an equality with domestic stock and not secondary.

We know that domestic stock can be produced on all the farms in the United States. We know that the areas suitable to the production of game are limited. We know that the demand for game is away ahead of the supply and what may be supplied for a long time to come. We will probably never again be able to produce enough game in the United States to supply the demand. The reason for overpopulation of game in certain sections is not due to lack of demand but to improper marketing procedure. So it will be unnecessary to decide just what an adequate supply of game is. It will be impossible to decide that question until the supply begins to approach the filling of the demand. The policy to follow, on National Forest ranges at least, should be to

give game a prominent place in management on all areas where there are favorable conditions for game to thrive. Not all National Forest areas are natural game ranges, and this policy would not exclude domestic stock everywhere. But game should be given an equal place with other stock in range management.

Game management plans should be made effective for each game area. Each plan of management will be different because different treatment will be necessary for different areas. However, there are certain broad principles that must be considered in every game management plan. These principles may be stated as follows:

Biological Nature of the Species. (Physical makeup.)

Environmental Requirements. (Cover and Food.)

Objectives of Management.

Present Capital Stock—Of cover, and seasonal ranges.

Present Capital Stock—Of Food supply.

Present Capital Stock—Of animals.

Procedure.

Then in actual practice, game management would be to manipulate the capital stock to the end that the objectives may be realized.

There is one big obstacle in game management that might upset the practical operation of any plan, and that is the method of disposal of the surplus. The disposal of the surplus is done through state agencies. The land manager may grow game scientifically and may know how many animals should be removed, but another agency has control of such removal. Bad state laws, or lack of understanding and co-operation on the part of state officers, may upset all the plans of the land manager. The responsibility for disposal of surplus should be in the same agency that produces the game. However, it is not so at the present time, and may not be any different for years to come, so we will have to take conditions as they are and work out the best solution possible. We will have to get state agencies into the actual game management on the range. We must try to get more flexibility into state laws and more authority into state game commissions. Especially should state game commissions have authority to regulate and change seasons, license fees, and bag limits. When state game commissions do have such authority, they are sometimes reluctant to use it because of the fear of adverse public opinion. There are a lot of sportsmen that are ignorant about game, but who are influential men and have a lot to say. One of the jobs of the Forest Service should be to sell game management to the sportsmen.

I like Hill's outline, "Scope of Responsibilities of Different Officers in Wild Life Management."

A game management plan for the Kaibab has been in existence for several years. It cannot be taken as a finished plan, because game management is so new that it is in an evolutionary stage.

1. Which factors can be manipulated under normal National Forest conditions?

1. Hunting is controlled by the State.
2. Predators, their control or extermination, is primarily a function of the Biological Survey.
3. Starvation or its elimination, which occurs primarily in the winter, is in the hands of the State.
4. Disease, while it can be reported in some measure by Service Officials, is controlled through Government and State Departments versed in diseases of animals.
5. Accidents, like with human beings, are apparently unavoidable.

Therefore, under present conditions, at least those existing in Colorado, the Forest Service is not at present able to control absolutely any of the five direct factors. We can assist, or rather co-operate.

Of the four indirect or welfare factors, we can and should take a definite stand.

With respect to the 5-direct factors, the Service should assist in the movement necessary to get the ownership of Game definitely lined up to go with the land, to see that other Departments assume their full responsibility in the control of predators and disease, so that there will be efficient action possible and taken as relates to these 5-direct factors.

In the meantime the Forest Service can and should take definite action towards working out in an efficient way the 4-indirect or welfare factors, consisting of food supply, water supply, coverts, and special.

2. This means an intensive study of the habitat, propagation and food of our Game animals. We know in a general way that Elk use more or less the same species of plants that cattle do, because in our travels over the Forest we have come upon areas of range used exclusively by Elk, and we know that deer confine themselves pretty much to the browse type of feed when they are able to secure it.

The majority of the field men in the Service have not had time to give this phase of our work the time and study it needs, and as time goes on there seems to be less.

I am therefore very much in favor of specialists assigned to two or more forests whose only thought will be game management, and who can make intensive studies.

We say we have 2,000 deer, 1,000 elk and 50 mountain sheep, but it's a wild guess at best. We need more accurate figures on numbers, their habits, their feed requirements and how they affect our domestic stock situation. We have many cattle allotments that we feel are too heavily stocked and that we are concerned about cutting carrying capacities on. Perhaps it's not altogether

cattle, but partly game.

I believe that Mr. Hill has given a very good plan as to the proper distribution or division of responsibility, and that if each branch from the top down assumes that responsibility and gets his part under way and fulfilled we can actually and successfully arrive at Game Management.

G. E. MITCHELL

SISKIYOU

GRANTS PASS, OREGON

Game is a broad term, and what may interest one community may not be considered by another. I am going to confine my remarks principally to deer and elk, because I think they are by far the most important game animals in the United States.

I think Bob Hill has sounded the keynote to game management when he raises the question of ownership. Just so long as the State assumes the ownership of game, and the State Game Boards are controlled by politics, we can expect but little advancement from the scientific standpoint in game management—and the first requisite of successful management is to determine and record the scientific facts concerning the thing to be managed.

The game resource has probably suffered more from unscientific management than any other thing we attempt to manage.

Assuming that the ownership will remain as it is, our problem is, "What can we do to improve the situation?" The Forest Service has more responsibility in game management than any other organization, because it controls a much larger area of game range than any other single agency.

Our first problem, then, is to determine just how we are going to divide the range between game and domestic stock. I believe we have been prone to be a little too optimistic when it comes to providing range for game. In many cases we have felt that the isolated areas, unused by domestic stock, provided sufficient feed for game. In some cases they do, but in many they do not. In many places the natural range for deer is the National Forest area in summer, and the privately owned foothills in winter. The winter range is invariably overgrazed, and winter losses are great. But where the deer find a combination of overgrazed winter and summer range, then their chances are very slim.

It seems to me that one of the first steps to be taken by the Forest Service is to decide which range will be used by game, and which will be used by domestic stock. We have been laboring for a long time under the theory that we should provide for all the domestic stock that can be wintered on adjoining farm lands. We have even reduced the established stockman to make room for the few stock that the timber homesteader or marginal landowner wants to run. In many cases we have done this to the detriment of the range. (I wish someone else would confess to this, too.)

But the new era may change this. The new policy of proper land use may change the entire picture, and when it does, game should be given due consideration. Suppose we were to make such classification of National Forests—

it would work out fine if we could induce State and county boards to do likewise with outside lands. But how about the private lands? It is a hard nut to crack. The more I think of it the more I am inclined to believe that we will have to establish our own deer ranges and provide feed or some other means of winter sustenance. Unless the ownership problem is satisfactorily worked out, the National Forests will be the most likely game areas. So our first move, then, will be classification of range, and adjustment of carrying capacities.

We must know how much game is worth and what consideration it should receive with domestic stock. A couple of years ago an article was published in the "Service Bulletin" about the value of game on the Sierra Forest. As I remember, they registered in about 7,000 hunters who took out 1,400 deer. They figured each hunter spent \$20 on the trip, or \$140,000 all told. Therefore, the deer were worth \$100 each. I suppose the logical thing to do is figure out what a cow is worth, considering the ranch investment, and thus determine which is the proper one to keep. If proper land use is kept in mind, this may be the equation.

Having decided on a range, the next step will be to determine the carrying capacity of that range. We can only hope to maintain as many animals as the range will support, regardless of the number of enthusiastic hunters. The Kaibab Forest experiment is a splendid example of overstocking. Pennsylvania also experienced an overabundance of game, and found that many yearlings died, due to inability to find feed after weaning.

I don't know what an average range capacity is. Some say five deer per square mile is good stocking. That is only one deer to each 128 acres. In our country we figure 30 acres of average range will run a cow 6 months. Surely a deer will not eat more than a cow. On the same basis, 60 acres should run one animal a year. This would give a population of 10 per square mile. That seems small, but some definite information along this line would be valuable.

When a definite population or carrying capacity is established, then we should set up control measures to regulate the increase to keep it about fixed. Counts should be made annually during winter concentration to determine the population. I was disgusted with the decision of the control board of the Kaibab when they decided to withdraw predatory animal control as a measure to reduce the numbers of deer. Maybe I am not familiar with all the facts, but I believe there were enough hunters in the United States who could and would avail themselves of the opportunity of killing the surplus deer. I realize the State ownership problem enters into it. But why grow game for predators?—human or otherwise?

Deer are very prolific, and increase, under full protection, about 75 per cent annually. On the average open range, however, 25 per cent is a good increase. In other words, there is a loss of about 50 per cent. The average increase can be determined by counting the yearlings in various bands in the spring. The greatest losses in deer are from poor range, predatory animals, and disease. The first two can be controlled, but the third is more difficult. But given good range and controlled population, disease will be kept at a minimum. These

same principles should apply to control measures with practically any kind of game. Of course, small game, such as rabbits and squirrels, do not need separate ranges, as they fit in with agriculture and civilization quite well.

Game birds, such as quail, Chinese pheasants, and imported species, seem to thrive on civilization, but our native birds, such as ruffed grouse, pintail, sage hen, heath hen, and blue grouse, do not. There is too much disturbance in their life cycle by dogs, cats, humans, and predators, such as eagles and hawks.

When I first began to think of game management, I was greatly impressed with the lack of detailed knowledge available on game animals of any kind. Fish seemed to have been studied, and quite a comprehensive history of information gained and recorded. There was also considerable information on imported game birds, such as Chinese pheasants, Hungarian, etc., but practically none on our native birds. The pintail grouse, or prairie chicken, is about to go the way of the sage hen, but the only information one can get is from some of the old timers.

The great difficulty, as I see it, is that no attempt has been made to build up a science or history of our game. The game has been considered the property of the State. Its management has been left to politics, and in many cases the game has been the goat, so to speak. A new political regime appoints a new game administrator; he is in power for two, four, or six years, and learns a lot about game. But the next administrator knows nothing about it, and his predecessor will leave nothing. So each man in turn must learn his business at the expense of the game, be it good or bad. This condition will never change so long as the management of the game and wild life resources are subject to the whims of politics.

If the plan to vest the title of the game to the land fails, then I would say the next best move would be to seek the establishment of a game control board in each state, not affected by politics.

I would say, then, that the Federal Government should take the lead in building up a science of each class of game. This may be done independently or through the co-operation of game clubs and associations. I once lived where the game resources were handled by a county board of game commissioners. Their principal interest was fish. I knew that certain lakes had been stocked by different boards of commissioners many times, and each time the attempt failed. The water was not suited for fish, but there was no record to show it, and thousands of fish were sacrificed every few years to teach each board that such was a fact.

I worked out a plan to make a complete survey of the county, and by use of a questionnaire record the conditions of each stream and lake. Each game club would be responsible for a given area, and maps would supplement the written data. The complete information would be assembled and used as a basis for planning the future plantings. The game clubs were enthusiastic, but the game commissioners turned it down, declaring they couldn't have the sportsmen telling them how to run the business. It never went through, but I still think

it was a logical step toward scientific management.

Before anyone can start any kind of management or environment control, they must know something about the life history of the thing to be controlled. Strange as it may seem, deer have been hunted in the United States for over **three hundred years**, but I was unable to find any information that would help me to determine the age of a deer. We used to think that horn prints indicated age, but now we know that is not true. For example, I knew of two bucks, one a mule and the other a whitetail, each growing their first horns at one year of age. The mule buck had a forked horn and the whitetail had three prongs. I did find out that there is a constant development of teeth up to three years **of age**. **My** conclusions were that a deer develops a full mouth at three, and after that one can't tell their age. But one should be familiar with all the **facts concerning the game** to be managed before any attempt is made toward management, or they may do more harm than good.

Much can be accomplished through the local sportsmen if they are properly organized and given definite jobs to perform, or information to secure. **There** should be someone in the Region at least who could contact these clubs, gather **and correlate** information obtained, and keep up the interest. Under the present setup, a game manager on each forest would have little to do. On the other hand, if the ownership of the game were vested in the U. S. Government, such a position would be necessary.

Undertaken in the desirable way, the various Government bureaus could contribute much to the technical facts so necessary, but the trained biological and range management man would be very desirable on each Forest or, say, groups of forests, and not more than three.

